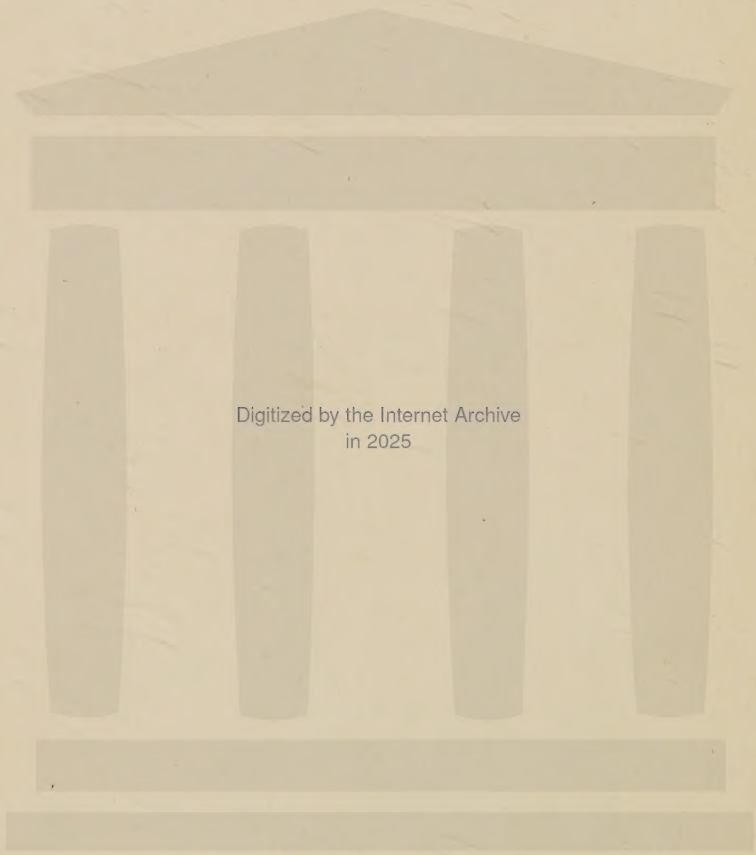
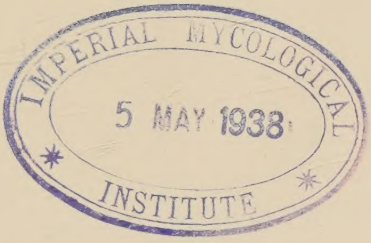

Digitized by the Internet Archive
in 2025

https://archive.org/details/bulletin-kentucky-agricultural-experiment-station-uky_1927_part-1

SCANNED



FORTIETH ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

University of Kentucky

FOR THE YEAR 1927

Part II

Bulletins 277-282

Circulars 36-38

25/C

IMPERIAL BUREAU
16 JAN 1929
OF MYCOLOGY

FORTIETH ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

University of Kentucky

FOR THE YEAR 1927

Part I.

Report of the Director

Meteorological Summaries

UNIVERSITY OF KENTUCKY

Lexington, Ky.

Board of Trustees

Hon. Flem D. Sampson, Governor, Chairman *ex officio*
W. C. Bell, Superintendent of Public Instruction, *ex officio*
Newton Bright, Commissioner of Agriculture, *ex officio*
J. M. Finch, Helena, Mason County
R. J. Bassett, Leitchfield, Grayson County
H. M. Froman, Lexington, Fayette County
Richard P. Ernst, Covington, Kenton County
Robert G. Gordon, Louisville, Jefferson County
Richard C. Stoll, Lexington, Fayette County
James W. Turner, Paintsville, Johnson County
W. J. Webb, Mayfield, Graves County
Frank McKee, Versailles, Woodford County
Howard P. Ingles, 14 Wall Street, New York City
Louis E. Hillenmeyer, Lexington, Fayette County
E. B. Webb, Lexington, Fayette County

EXPERIMENT STATION STAFF

BOARD OF CONTROL

Richard C. Stoll, Chairman, Lexington, Ky.
H. M. Froman, Lexington, Ky.
R. G. Gordon, Louisville, Ky.
Frank McKee, Versailles, Ky.
R. P. Ernst, Covington, Ky.

Frank L. McVey, President

Thomas P. Cooper, Dean and Director

ADMINISTRATION

T. P. Cooper, Director
D. H. Peak, Business Agent
O. L. Ginocchio, Secretary

AGRONOMY

George Roberts, Head
E. J. Kinney, Assoc. Agronomist
P. E. Karraker, Asst. Agronomist
J. F. Freeman, Asst. Agronomist
W. D. Valleau, Plant Pathologist
E. N. Fergus, Asst. Agronomist
J. B. Kelley, Agricultural Engineer
E. M. Johnson, Asst. Plant Pathol.

ANIMAL HUSBANDRY GROUP

E. S. Good, Chairman
W. S. Anderson, Horses
L. J. Horlacher, Beef Cattle, Sheep
E. J. Wilford, Swine, Meats
W. J. Harris, Beef Cattle
J. Holmes Martin, Poultry
L. W. Taylor, Poultry
J. W. Nutter, Dairyman
Amanda Harms, Asst. Path. Bact.
Harold Barber, Head Herdsman
J. O. Barkman, Act'g in Charge Dairy Husbandry
G. D. Buckner, Animal Nutrition

ANIMAL PATHOLOGY

W. W. Dimock, Head Vet. Science
Philip R. Edwards, Asst. Bact.
F. E. Hull, Asst. Veterinarian

CHEMISTRY

J. S. McHargue, Chem., Act'g Head
A. M. Peter, Chemist
S. D. Averitt, Chemist
O. M. Shedd, Chemist
W. D. Iler, Asst. Chemist
D. J. Healy, Bacteriologist
E. S. Hill, Asst. Chemist

CREAMERY LICENSE SECTION

J. D. Foster, Inspector, in Charge
W. C. Eskew, Inspector

ENTOMOLOGY AND BOTANY

H. Garman, Head
Mary L. Didlake, Asst. Entomologist
H. H. Jewett, Research Asst. Entgst.
Jessie Terry, Seed Analyst
Lucille Dobbins, Seed Analyst

FARM ECONOMICS

W. D. Nicholls, Head
W. G. Finn, Farm Management
W. L. Rouse, Farm Management
R. E. Proctor, Farm Management
*Z. L. Galloway

FEED CONTROL

J. D. Turner, Head
H. D. Spears, Chemist
W. G. Terrell, Inspector
Fred Fitschen, Inspector
L. V. Amburgey, Microscopist

FERTILIZER CONTROL

H. E. Curtis, Head
Harry Allen, Chemist
Lelah Gault, Asst. Chemist
Robert Mathews, Inspector

HOME ECONOMICS

Mariel Hopkins, Head
Statie Erikson, Asst.

HORTICULTURE

C. W. Mathews, Head
A. J. Olney, Asst.
C. S. Waltman, Asst.

MARKETS AND RURAL FINANCE

**O. B. Jesness, Head
Dana G. Card, Marketing
E. C. Johnson, Marketing
K. R. Zent, Marketing

PUBLIC SERVICE LABORATORY

L. A. Brown, Head
A. L. Meader, Asst. Chemist
James H. Martin, Asst. Chemist
E. K. Borman, Bacteriologist
O. H. Pinney, Asst. Bacteriologist

ROBINSON SUBSTATION

(Quicksand, Ky.)

R. W. Jones, Superintendent
C. H. Burrage, Forester
Lula Hale, Field Worker

WESTERN KY. SUBSTATION

(Princeton, Ky.)

S. J. Lowry, Superintendent

*Assigned by the U. S. Department of Agriculture.
**On leave of absence.

LETTER OF TRANSMITTAL

To His Excellency, Hon. Flem D. Sampson, Governor of Kentucky:

Sir:—In accordance with an act of Congress, approved March 2, 1887, entitled, "An Act to establish Agricultural Experiment Stations in connection with the Agricultural Colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," and of the act of the Legislature of the State of Kentucky, approved February 20, 1888, entitled, "An act to accept the provisions of an act passed by the Congress of the United States, approved March 2, 1887, for the establishment and maintenance of Agricultural Experiment Stations in connection with Agricultural Colleges established by the several states and territories under an act of Congress approved July 2, 1862," I herewith submit the Fortieth Annual Report of the Kentucky Agricultural Experiment Station.

Very respectfully,

THOMAS COOPER, *Director.*

January 1, 1928.

ANNUAL REPORT

of the

DIRECTOR OF THE

KENTUCKY AGRICULTURAL EXPERIMENT STATION

For the Year 1927

The progress of an institution organized for research and service is represented by a series of painstaking experiments and many services that appear more or less routine. The developments chronicled from year to year may have, eventually, a very marked effect upon agricultural welfare and progress, for it has been thru the adoption of the results of research that progress has occurred.

One of the encouraging features of Kentucky agriculture is the increased interest in, and the wider use of, experimental results.

A large number of important research projects have been in force the past year. Some have been particularly productive in practical results; others are in the stages of accumulating basic information. Among the more important projects of direct application to agriculture and briefly recorded in this report, is that of the study of infectious abortion in cows and mares. This project has been in force for a number of years, but during the past year, a very definite advance has been made in the development of antigens from different strains of the organism carrying infectious abortion. This has enabled the diagnostician to determine with a greater degree of accuracy than formerly the cows that have had the germ of infectious abortion or are harboring it. This discovery should be very helpful in making possible, ultimately, the control of this infection.

Studies of tobacco diseases led to a series of investigations that gave new information relative to the cause and control of the so-called "frenching." This disease has been associated with abnormal soil conditions, but its cause has not previously been known. It now appears to be established that it is caused by a deficiency of available nitrogen brought about by various soil conditions. Since the same type of disease occurs in other plants, such as the rosette of apples and pecans and the frenching of citrus trees, the whiptail of cauliflower and perhaps the so-called crazy-top of cotton, the results of this investigation are likely to have wide application both in an understanding of these diseases and in applying, more intelligently, remedial measures. There is also reason for believing that this investigation will open the way to an understanding of other physiological disturbances in fruits and trees which are of considerable economic importance, such as the bitterpit, drouth-spot, and the so-called measles or brown bark spot of apples and blossoms-end-rot of tomatoes.

These investigations are but briefly mentioned as an illustration of the application of research to the farm and of their far reaching effect. Many other investigations show equally effective and important results.

Marked progress has been made in the material and physical equipment of the Experiment Station and its two Substations in western and eastern Kentucky. The poultry plant at the Experiment Station was doubled in area and a number of new buildings were erected, including a thoroly modern brooder house. All buildings are of frame construction but of a type that should be useful for many years and that should serve to take care of the growth of experimental work in this field. A new tobacco barn was constructed to replace one destroyed by a windstorm.

Improvements at the Western Kentucky Substation consist of a combination barn and machine shed, a laborer's cottage, a farm water supply from the city of Princeton, and the fencing of a large part of the farm.

The Robinson Substation in eastern Kentucky lost one house and a large part of the farm crops in the disastrous flood that occurred in June, 1927. The work of wrecking the old building formerly occupied as a sawmill has been finished, which, incidentally, completes the clearing of the headquarters area at Quicksand of the large number of useless buildings, railroad tracks and debris incident to the abandonment of sawmill operations. The Louisville and Nashville Railroad Company conveyed as a gift to the Robinson Substation certain lands and rights-of-way on or contiguous to the state property at Quicksand. A headquarters cabin for the forester has been constructed at Camp Robinson on the forest tract.

The transformation of the village of Quicksand in which was located one of the largest hardwood flooring plants in Kentucky and of a lumber camp to a farm and an experimental forest has been a tremendous task, but it has been accomplished in a manner that conserves for public use all its potential values. The farm land has been made productive and demonstrates some of the agricultural possibilities of eastern Kentucky. The forest land is being protected from fire and so managed as to eventually give much information concerning the economics of timber production under private ownership.

Lands on which the Western Kentucky Substation is located had been, to a large extent, so farmed that they were reduced to a low state of productivity. This area is typical of much land in western Kentucky that is unproductive. During the year, the clearing of brush from the poorer lands was completed and most of the land broken. Following an application of lime and phosphate, cover crops were grown and turned under, the land then being sown to grass mixtures and clovers to further restore its productive capacity. The pastures that have been produced demonstrate the fact previously brought out at the experimental soil fields that abundant pastures could be produced, even on the poorer lands, by the proper soil treatment and that within a short period of time the soil could be restored to a high state of productivity.

A report of the research work of the Experiment Station but partially presents its activities and importance to the state. A large volume of work is carried on in the laboratories and by various specialists which consists primarily in giving service to groups and to individuals. The correspondence covers a wide range of questions pertaining to the farm, home and community. Many of the inquiries are requests for information particularly desired by the individual and of special importance to him.

The Experiment Station is so organized that a very large volume of its work has to do with the protection of the citizen. Various regulatory acts, such as feed and fertilizer control, seed and nursery inspection, creamery license control, are administered by the Experiment Station. These measures serve to educate the public in regard to the care that should be exercised in the use of products and afford protection from fraud and adulteration. These acts have been very effective aids to agriculture and are regarded by the public as of increasing importance. The work of the public service laboratories is primarily of service in the protection of health thruout the state. Its services are in constantly growing demand and the analyses and examinations made by these laboratories have increased from approximately 30,000 a year to over 50,000 in number.

Factors for Profitable Farming. A business analysis of 163 representative farms in Green, Taylor and Adair Counties was made for the year ended March 1, 1927. The farms were grouped according to net earnings. The average farmer in the lowest group, the least profitable one-sixth (25 farms), earned 2 per cent on his investment of $8,448 after paying all farm expenses and allowing a value of $193 for his labor. After paying all expenses of farm operation and allowing 5 per cent interest charge on his investment, he failed by $59 to receive any pay for his own labor. A striking contrast is furnished by the most profitable 25 farms. These had an average investment of $9,262, this larger investment being due chiefly to more equipment and livestock. These most success-

ful farmers made on an average 17.6 per cent on their investment or net earnings of $1,552.

The total expense of operation of the most successful farms, including 5 per cent interest charge, was only $140 greater per farm than that of the least profitable group. This is especially significant in view of the fact that the receipts of the better group exceeded the others by $1,754 per farm and were more than twice as much per acre ($19.52 compared with $9.38.) In other words, the most successful 25 farmers made net earnings of $10.42 per acre operated, while the least successful 25 farmers received nothing for their labor and failed by $0.48 per acre to earn enough to pay 5 per cent on the investment.

The factors accounting for differences in profits were more and better livestock; better cropping systems; higher crop yields per acre; better balance between crops and livestock; larger receipts; more effective spending, and size of business.

Cost of Production Studies in Central Kentucky. An analysis was made of the cost and returns of crops on representative farms in Central Kentucky, for the period 1921 to 1926. A point of considerable significance is the marked difference in the unit requirements on these farms. Thus the item of man labor per bushel of corn grown and harvested varied from .58 hour on one farm to 1.3 hours on another, more than twice as great. This difference was shown to be due to a number of causes the most important of which were yield per acre, size of implements, size of fields, and extent to which the farm work was planned, scheduled and dispatched.

Business Analysis of Christian County Farms. To determine the factors for profitable farming in that region, a study was made of 56 farms in Christian and Todd Counties. The most profitable 12 farms returned about twice as large net earnings for the year's work and management of their operators as the average of the 56 farms, and about one and a half times the rate of return on the capital invested. The most successful farms had a volume of sales nearly 30 per cent greater than the average. The expense per dollar of income

was 54 cents for the most successful farms and 71 cents for the average of the 56 farms, with interest counted as an expense. Two major expense charges of particular significance were those for hired labor and machinery. About one-half of the farm income for the most successful farms was derived from livestock. Size of farms did not appear to be a major factor for profits on these farms. The most successful farmers considerably excelled their fellow farmers in the utilization of labor at their disposal.

Farm Tenancy Studies. The phases of this study include the trend of tenancy in representative agricultural regions; incomes of tenants and the rate of return of landlords on tenant-operated farms; an examination of terms of farm leases which have proved mutually satisfactory to tenants and landlords, and the effect that moving from farm to farm has on the school attendance of the children of tenants.

Table 1. Trend of Farm Tenancy in Six Typical Central Kentucky Burley Tobacco Counties from 1880 to 1925.
(Percentage Tenant Farmers were of all Farmers.)

	1880	1890	1900	1910	1920	1925
	%	%	%	%	%	%
Bourbon	22.5	30.5	44.2	48.0	56.9	52.0
Clark	18.6	22.8	29.3	37.8	42.4	32.7
Fayette	31.6	40.5	44.5	47.0	54.2	46.8
Jessamine	21.8	27.3	28.8	37.6	50.2	40.5
Scott	21.2	34.6	42.9	42.6	40.8	42.4
Woodford	32.7	37.4	48.4	53.0	57.4	54.4
Average for 6 counties	24.0	32.0	40.0	44.0	49.9	44.7

Farm tenancy in central Kentucky counties has shown an increase generally between 1880 and 1920, but with a decline in 1925. The acreage of tobacco in the area indicated in table 1, declined 27 per cent, or from 58,273 acres in 1919, to 42,345 acres in 1924. The reason for the decrease of tobacco acreage and the number of tenants was doubtless connected with the

less favorable price conditions for tobacco following the post-war price slump.

A study made of the earnings of 55 tenant farmers for the years 1924 and 1926, has furnished important data as to the sources of income of the tenant and the farm expenditures. Coupled with this was a study of the tenant farmer, an analysis of the returns made to landlords, altho the latter does not represent farms identical with the tenancy study.

Table 2. Comparison of the Earnings of 55 Tobacco Tenants of Fayette County in 1926 with those of 1924.

	Average of 55 Tenant Farmers, 1926	Average of 55 Tenant Farmers, 1924
Labor income	$170.65	$650.94
Net earnings	628.16	1,051.18
Tobacco acreage	10.07 A.	9.89 A.
Yield of tobacco per acre, pounds	942.	1,058.
Yield of corn per acre, bushels	44.16	40.25
Livestock net increase	$221.36	$145.65
Sale of livestock products	111.20	104.54
Receipts from tobacco	612.95	1,110.16
Receipts from other crops	175.35	141.49
Receipts from other sources	77.96	55.16
Total expenses	911.62	791.16
Cost of hired labor, board and rations	467.47	390.96
Price received for tobacco	12.92	21.21
Tenants' receipts per acre	60.87	112.24

The average labor income of 55 tenant farmers was $170.65 in 1926, as compared with $650.94 for the same farmers in 1924. The average net earnings, which includes things furnished the family by the farm (including rent for tenant house) was $628.16 in 1926, as compared with $1,051.18 in 1924.

The outstanding difference is in the price of tobacco. The average price received by these farmers in 1926 was $12.92 as compared with $21.21 in 1924. This shows up in the same way

in tenants' receipts per acre from tobacco. The averages are $60.87 in 1926, and $112.24 in 1924.

Figures obtained show that in 1924, 176 landlords made, on an average, 12.11 per cent on their investment and $24 rent per acre on that portion of land operated by tenants, while in 1926, the corresponding figures were 7.5 per cent and $11.50 per acre.

To determine the effect of tenant moving on school attendance, a study was made of the attendance records of 19 representative rural white schools and 5 colored schools.

The average net enrollment for the nine school months, for the 19 grade white schools, was 1,214.55; for the two high schools, 86; and for the 5 colored schools, 306.22.

The total number of white grade pupils leaving school during the entire year was 527, or 43.4 per cent of the average net enrollment. Out of the 527 who left school during the year, 294, or 55.8 per cent left during the tenant moving period —January, February and March. This is nearly 25 per cent of the average net enrollment. The total number of high school pupils leaving school during the entire year was 26. Of this number, 14 (53.8 per cent) left during the tenant moving period. The total number of colored pupils leaving school during the entire year was 26. Ten (38.5 per cent) left during the tenant moving period.

The total new enrollment of white grade pupils during the year was 416, and that during the moving period was 199. The total new enrollment of high school pupils was 6, of whom 5 enrolled during the moving period. The new enrollment in the colored schools for the year was 29, and 7 of them enrolled during the moving period.

In addition to keeping a large number of pupils out of school for two or three weeks while they are in the process of moving, a considerable proportion of pupils fail in the current year to enter school in the district into which they have moved

Agricultural Credit and Finance. A study is being made of the agricultural credit situation in Kentucky. The project has not progressed sufficiently as yet to allow definite conclu-

sions to be drawn. An analysis of the data obtained will be continued during the coming year and promises to yield many important facts regarding the farm credit situation in this state.

Census data have been analyzed for the purpose of learning something of the capital requirements for farms in different sections of the state and of changes which have taken place in farm mortgage indebtedness. The total value of all farm property in Kentucky on January 1, 1925, was $963,568,916, according to the census. The average value of all property per farm was $3,727 divided as follows: Land, $2,384; buildings $894; livestock $331 and machinery $118. In 1910, the average mortgage debt for farms operated by owners who reported mortgages was $906; in 1920, it was $1,889 and by 1925, it had increased to $2,196. In 1920, the farm mortgage debt averaged 29.1 per cent of the value of land and buildings on the farms mortgaged and in 1925, it was 43.3 per cent. The change was due largely to the fall in land values between 1920 and 1925.

Information on farm mortgage loans has been secured from the Federal Land Banks, the Joint Stock Land Banks, and several insurance companies. Reports giving the amount of long term and short term loans to farmers and the interest rates charged have been obtained from over one hundred state and national banks in Kentucky. Merchant credit to farmers has also been studied and consideration has been given to the operations of the Federal Intermediate Credit Bank in Kentucky.

A survey was made during the year in four counties for the purpose of securing data relating to the credit problems of individual farmers. Records were obtained from 98 farmers in Graves County, 48 in Christian, 76 in Warren and 40 in Fayette. These records are now being analyzed.

Soil Experiment Fields. A summary of the crop yields on seven soil experiment fields, outside of the Bluegrass Region, gives some interesting information on what may be expected in the development of the agricultural lands of Kentucky when they are well managed. These fields have been in operation

for periods ranging from 9 to 15 years. All of them were established on soils that had been reduced to a low state of productivity and typical of the regions in which they are located. A rotation of corn, soybeans, wheat and clover was used on four fields; corn, wheat, clover on one; corn, soybeans, rye (not harvested, clipped down) and clover on two. On three fields additional rotations of tobacco, wheat and clover were used. In all the rotations, except the tobacco rotations, manure or crop residues (cornstalks or wheat straw) have been returned to both fertilized and unfertilized plots alike for approximately half the time. The amount of manure and residues thus returned has been below what the farmer can do in farm practice. No manure has been used in the tobacco rotations except for two crops of tobacco at Campbellsville. The following is a summary of results to date:

	Unfertilized	Fertilized with Limestone and Superphosphate	Difference
Corn, Ave. 88 Crops (Bus.)	26.8	44.2	17.4
Soybean Hay, Ave. 73 Crops (Lbs.)	2,218	3,533	1,315
Wheat, Ave. 49 Crops (Bus.)	7.7	16.6	8.9
Clover, Ave. 61 Crops (Lbs.)	921	2,990	2,069
*Tobacco, Ave. 31 Crops (Lbs.)	492	888	396
Wheat, Ave. 26 Crops (Bus.)	7.5	21.3	13.8
Clover, Ave. 28 Crops (Lbs.)	943	3,340	2,397

*Where tobacco was liberally fertilized with nitrogen and potash in addition to limestone and superphosphate, the average yield for the 31 crops was 1,058 pounds per acre.

There is no doubt that by the general use of limestone, phosphate fertilizers and legumes the average yields of these

crops in the State may be maintained at as high a level as the figures indicate, if not higher.

The results obtained on the Fariston experiment field this year are particularly striking:

	Corn Bus.	Soybean Hay Lbs.	Clover and Timothy Lbs.	
			1st Crop	2d Crop
No treatment	9.6	1,080	400	000
Manure (6 tons per acre)	20.2	1,350	.....	.....
Limestone and Superphosphate + manure (6 tons)	55.1	5,300	.....	.....
Limestone + Superphosphate	46.0	3,200	3,400	1,550

The manure is used on corn, and the soybeans receive the residual effect. As manuring has been in effect only three years, the clover was not affected by it. The rotation is corn, beans, rye (not harvested) and clover. The marked effect of manure on soybeans is probably due to the potash supplied in the manure, as the unmanured plot receiving limestone, superphosphate and potash produced exactly the same increase as did the manure.

The results with rock phosphate and superphosphate on the Campbellsville field continue to show in a striking way the effect of lime in depressing the availability of rock phosphate. The results obtained on this field suggest a clue to the proper method for using rock phosphate, namely, to use enough fine lime to satisfy the lime requirement and then use rock phosphate. For regions close to the phosphate fields, the use of rock phosphate offers an opportunity to soon build up a stock of phosphorus in the soil which would in a short time obviate the further application of phosphates under good soil management.

Tobacco Virus Diseases. Studies on the infecting of tobacco plants from natural leaf chewing tobacco have been continued and indicate clearly the importance of this source of the

disease. While weeding, or especially while pulling, a man chewing natural leaf tobacco will occasionally contaminate his fingers with the virus, which is then transmitted to an occasional plant as it is pulled. Figures for three years show that infection following setting averages about 7 per cent if the men pulling plants chew natural leaf tobacco, while for two years the percentage was reduced to .44 and .05, respectively, when the men chewed only steam sterilized tobacco while pulling. The latter figure was obtained on a total of about 70,000 plants. Plants pulled by the same men while chewing viruliferous natural leaf tobacco and making no special effort to contaminate the fingers developed between 4 and 5 per cent of mosaic. When the fingers were purposely contaminated with viruliferous saliva by spitting on the fingers, the disease rose to 80 per cent. In western Kentucky, where solanaceous weeds are less abundant than in the Burley section, the elimination of chewing tobacco alone seems sufficient, in many cases, to completely control the disease. In the Burley section, if these weeds are abundant, as many as 3.5 per cent of the plants may become infected with mosaic by topping time.

One year's results indicate that inoculation of Burley tobacco at setting time with a mild strain of true tobacco mosaic reduces the yield nearly one-half and the value of the crop 60 per cent; inoculation at topping time, while not reducing the yield, yet reduces the value of the crop 25 per cent. This reduction in value appears to result mainly from the production of a darker color in the cured product.

The list of virus diseases of tobacco includes, at present, in addition to five apparently distinct strains of true tobacco mosaic, the following: "etch," "etch +," "severe etch" and "vein banding," which may be a very mild strain of "etch;" "ringspot;" "coarse etch;" and a similar one apparently identical with the so-called "healthy potato virus;" "puff," which is apparently identical with cucumber mosaic, and "severe puff," which also causes cucumber mosaic. These diseases are all of economic importance in tobacco growing. Ringspot has been transferred from mosaic cucumber plants,

naturally infected, to tobacco and, therefore, may be a cause of this disease. There is a close relationship between the abundance of solanaceous weeds apparently infected with virus diseases and the degree of infection of tobacco plants with the various virus types. Only the true tobacco mosaic appears to be carried in dry tobacco.

Tobacco Leaf-Spot Diseases. The results of tests at Lexington and at the Western Kentucky Substation suggest that random lots of seeds carry angular leaf-spot infection, but that the more carefully selected seed (98 lots at Lexington and 43 at Princeton) are either free from infection or are freed by the hot water treatment. A new feature of the leaf-spot problem which appears to be of importance is the discovery that much of the spotting, both of dark tobacco and of burley, previously attributed to the angular leaf-spot organism, *B. angulatum*, is actually a physiological spotting. The physiological spots are characterized by concentric rings, while the angular leaf-spot rarely, if ever, develops these rings. Manure, potash and tobacco stalks each appears to reduce the amount of spotting markedly. It appears that much of the blackfire of western Kentucky, formerly thought to be caused by *B. angulatum*, is physiological. The physiological spot has developed in the greenhouse on Turkish tobacco plants growing in ½-gallon jars of heavily nitrated soil from a continuous corn plot, unmanured. Plants in a similar soil manured did not develop the spots.

Chlorosis of Pin Oak. It has been found that the disease belongs in the group of chlorosis diseases due to insufficient iron brought about by an excess of calcium carbonate in the soil. Leaves painted or sprayed with a 1 per cent solution of iron sulfate developed a green color where the solution touched. Crude manganous sulfate failed to bring about recovery. The addition of ferrous sulfate or manganous sulfate to the soil, both in pots and outside, failed to affect chlorotic trees favorably.

Red Clover Breeding. The self fertilization studies with red clover have proved that there are strains within this crop

which are highly self-fertile and that this character is heritable. With the establishment of this fact, these studies, as such, are brought to a close and future work will attempt to develop and utilize superior pure lines for the improvement of the crop. As the result of crossing inbred strains of red clover with heterozygous mildew immune plants, several new strains of self-fertile plants have been secured. Some of these appear to be mildew immune, and it is believed it will be possible to fix this character in several pure lines. Intercrossing these may permit the development of an immune variety of sufficient heterozygosity to insure normal vigor. Attemps to secure an immune variety by means of mass selection have so far yielded only a variety of high resistance.

Foreign vs. Home Grown Red Clover. Yields from an extensive test of American and foreign red clover have shown certain American grown stock to be decidedly superior to foreign seed. For example, Kentucky grown seed averaged 3,593 pounds per acre for the first crop, while French averaged 2,318 pounds per acre and Italian, 339 pounds per acre. These tests showed that American grown clovers adapted for many years to their respective localities were not all of equal value for Kentucky, but that seed produced within or near the boundaries of the state was superior to that produced farther north. It should be emphasized that each of these strains had been grown for many years in the locality from which it was secured. Second crops showed even greater differences in favor of home grown stock.

A study of the failure of European strains as compared with local American strains showed a striking difference in stem growth in the spring of the second year. The American strains develop their first crop of stems normally, and it is largely these which are harvested for hay. The next crop of stems furnishes the seed crop or second hay crop. The foreign clovers, on the other hand, fail to fully develop their first stem growth; this growth makes more or less development, depending upon the strain, but on no foreign strain tested did it reach blooming. The Italian strain started into growth and the

plants died; the French strains made an average growth of 4 to 6 inches when they gradually died; the second crop stems replaced them and produced the crop cut for hay, after which a large number of these plants died. The stem growth of those remaining was very meager as compared with Kentucky strains. All American strains did not behave alike as regards stem production. Only the highest yielding strains performed as described. Other American strains showed tendencies toward the same performance noted in the foreign strains. The indicated cause of death of the stems in the spring appeared to be a fungus disease which caused blackening of the stems. The weaker growth of the European strains in the spring may have been due to the greater susceptibility of those strains to leafhopper injury the previous year.

Continuous Corn Culture. Since 1920, corn has been grown in continuous culture with different rates of manuring and with rye cover crop to determine whether it is possible to maintain yields. This inquiry is often made by farmers who wish to grow corn this way near their silos. The manure on continuous corn is used in even years at the various rates indicated in the table. The figures show the yields when the work was begun, the average yields from 1920-1926 and for 1927 in the continuous corn culture. With it is compared corn in a rotation of corn, wheat and clover on contiguous land.

		1920	Average 1920-1926	1927
No manure	Continuous Corn	70.0	40.0	15.7
10 tons manure	Continuous Corn	80.6	53.6	26.4
12 tons manure	Continuous Corn	70.6	46.6	30.7
15 tons manure	Continuous Corn	74.0	50.7	33.9
Corn in rotation without manure		57.7	54.7	33.3
Corn in rotation with 6 tons manure*		63.4	61.0	61.3
Corn in rotation with 8 tons manure*		66.7	61.8	58.9

*Manure used on each corn crop.

Alfalfa. The extensive tests of alfalfa strains and varieties started in 1925 show no great difference in yield and persistence of stand between any of those included in the test. Seed of Grimm was obtained from a number of seedsmen in an effort to determine to what extent, if any, common alfalfa was sold for Grimm. Apparently in every case in these tests the seed bought for Grimm is true to name. The average yield of 14 plots of common for the year 1927, three cuttings each, was 9,375 pounds per acre, and for 18 plots of hardy strains, 9,702 pounds per acre.

Soybean Inoculation. This is the third and final year's work with methods of inoculating soybeans. The application of as much inoculating soil as would adhere to moistened seed was again found to be as effective in producing nodules as the use of much larger amounts of soil applied in other ways. Two of the four commercial cultures used gave as good production of nodules as the soil treatments. Results from the other two were poor. Tests showed that deferred planting of inoculated seed up to six days, at least, did not result in appreciably poorer production of nodules.

Nitrogen in Fall Growth of Barley. In connection with the general high nitrate level in the soils during the fall and the considerable drop in nitrates after medium to heavy rainfall, the question arose as to what would be the effect of a larger plant growth than that of wheat in keeping the nitrates in the soil low thru using them in making plant tissues. A large growth of early sown barley on a certain field following tobacco in 1927 made possible the getting of limited data on this point. A small area on this field had not been seeded to barley. Nitrate determinations at a single time (November 30) showed the unplanted area to contain 68.7 pounds of nitrates per two million pounds of soil, and the corresponding figure for the planted area to be 18.5 pounds. The barley growth on the field (November 30) was found to amount to 4,738 pounds of oven dry material per acre (tops and roots). Determination of total nitrogen showed this acre amount of barley to contain 156 pounds of nitrogen. Of this, 130 pounds

were in the tops and 26 pounds in the roots (tops cut from roots 2 inches above ground line). Approximately 45 per cent of the total nitrogen in the oven dry barley tops and roots was water-soluble.

Poultry and Egg Marketing. A study of farm prices showed that during the last fifteen years, the price of turkeys in the United States has averaged nearly one and one-half cent per pound higher in December than in November. This is contrary to the belief of many turkey raisers. The January price has averaged about a cent higher than the November price. This difference in the average has not been due to a few exceptional years, because in ten years out of the fifteen the December price has been one cent or more above the November price, and in eight years, the January price has been one cent or more above the price during the preceding November.

There seems to be a slight tendency for capons to be seasonly high in price during the first part of January, lower thru the rest of the marketing season and higher again late in March. Of more importance to Kentucky producers, however, is the knowledge of the kind of capons in demand on the market. Heavy birds are usually in greatest demand. For the last seven years, the average price in New York for dressed capons weighing ten pounds and over was 47.3 cents per pound. The average price for eight-pound capons was 44.4 cents per pound, and that for five-pound capons, 35.8 cents per pound. A shift in demand from "capons dressed" to "clean dressed capons" has been noted, especially in eastern markets.

Supplements for the Laying Mash. The second year of this test was conducted, as previously, with Barred Plymouth Rocks. The results of the two years' work seem to justify the conclusions (1) that when Barred Rock pullets receive all the sour skim-milk they can drink and a mash is fed, the proportion of meat scrap in the mash need not exceed 5 per cent; and (2) that mash containing 2½ per cent meat scrap gave very satisfactory results and economical production.

Comparison of Common Ground Limestone and a White Limestone. Two pens of 25 Rhode Island Red pullets were in-

volved in this test which has been conducted for two years. Both pens were fed identical grain and mash mixtures and received water at all times. Pen 2 received a high-grade, white limestone and pen 3 common ground limestone. Neither pen received gravel or any hard quartz grit except such as could be picked up in the yards. The results in egg production are:

Pen	Mineral Source	Egg Production			
		Winter		Year	
		1925-6	1926-7	1925-6	1926-7
2	White Limestone	38.8	33.5	134.3	166.6
3	Common Limestone	24.8	38.2	109.7	149.8

On the basis of the average yearly egg production, there was a significant difference in favor of the white limestone pen both years. The fact that the common limestone pen laid so well during the second winter shows that it is quite possible to depend solely on common limestone as the source of calcium for egg shell formation and to secure very satisfactory and profitable egg production. The lower production from the common limestone pen during the first winter and during the first and second years may be accounted for by the fact that common ground limestone is less attractive and less palatable than white limestone. There is very little, if any, chemical difference in the two materials. When feeding ground limestone to poultry, it is particularly important that it be made readily available in open hoppers.

March vs. April Hatched Pullets. Early March hatched Leghorn pullets were compared with those hatched during the first half of April. Altho the extremely early hatched Leghorn pullets started laying a month earlier than those hatched at the normal (April) hatching season, they suffered a subsequent drop in production and actually laid fewer eggs during November, December and January than the April pullets. The April pullets proved more profitable not only because they laid ten more eggs per bird per year, exceeding the March pullets 9

eggs per bird from October 1 to January 31, but also because it cost less to produce an April hatched pullet than those hatched early in March.

Selective Flock Improvement. A long-time breeding project with Barred Rocks and White Leghorns has been established at the Princeton Substation. This experiment is based upon the practices of the rigid culling of females and mating with pedigreed males from high production ancestry. The object of the project is to test the efficiency and limits of the generally accepted method of improving flock production by selective flock breeding when detailed record keeping and trapnesting are not feasible.

From December 1, 1926, to September 1, 1927, the 200 Barred Rock pullets averaged 104 eggs each. Ninety-two of these birds were selected to be used for breeders during the 1928 hatching season. The 200 White Leghorn pullets averaged, during the same period of time, 158 eggs each and the 120 best were selected to be used as breeders during 1928. The winter egg production in the Barred Rock flock was 15.4 eggs per hen and in the White Leghorn flock 23.5 eggs per hen. These results will be used as a base-line from which to measure the effect of the culling and breeding project now under way. All cockerels to be used as breeders during the 1928 hatching season will be from trapnested hens with records between 240 and 260 eggs for their pullet year.

Ventilation of Laying House. The work at the Robinson Substation comparing the open front (baffler) type of ventilation with that of the pen equipped with the simplex ventilators was repeated. The second year's data were in quite close agreement with the results of the previous years. There was no apparent difference in the health or vigor of the two pens, altho the temperature in the open front pen usually ran from 2 to 4 degrees lower than in the other pen during the winter months. The following table gives the averages for the two years, each pen containing 25 Ancona pullets:

Pen No.	Ventilation	Winter		Year	
		1925-6	1926-7	1925-6	1926-7
A	Open front (baffler)	32 eggs	28 eggs	123 eggs	136 eggs
B	Simplex ventilator	31 eggs	28 eggs	122 eggs	130 eggs

It should be noted that both pens laid quite well during the winter months and thruout the year. There was no significant difference between the two.

Metabolism in the Chicken. Results indicate that the ability of laying hens to utilize the calcium of certain compounds is not affected appreciably by the alkaline or acid character of the ash of their foods. Two basal rations were fed containing equal amounts of protein of equivalent biological value, but so compounded that one ration gave an alkaline ash and the other an acid ash. Tricalcium phosphate, calcium sulfate and calcium carbonate were used as supplements to these rations The hens utilized the calcium of the phosphate and sulfate no better with one than with the other ration and utilized the calcium carbonate equally well with both.

Analyses of chicken droppings in the fresh state and when dried in the air and in an electric oven at 100 degrees C. showed that approximately 10 per cent of the total nitrogen present was lost during the process of drying. However, the advantage of drying the material to produce a commercial fertilizer is great, because water constitutes two-thirds of the fresh material.

Calcium carbonate, calcium sulfate and precipitated tricalcium phosphate have been added alone and combined to a mash consisting of yellow corn 80, middlings 20, sodium chloride 1 and cod liver oil 2 parts. The mash and skim-milk were fed ad libitum to growing White Leghorn chicks. One lot received 5 parts of calcium carbonate and 5 parts of tricalcium phosphate per 100 parts of mash and the other lots received the other calcium compounds or mixtures of them in such quan-

tities that the calcium content of the rations fed was the same. The daily consumption of the feeds was practically the same in all lots. The growth curves of the chicks in each lot show that those receiving tricalcium phosphate grew faster than the other lots and their general condition was better as shown by their feathering, color of combs and general activity. The bones of the chicks in the lots receiving tricalcium phosphate were heavier containing larger quantities of calcium and phosphorous than those that received calcium carbonate or calcium sulfate, or both. There was no evidence of rickets in the bones of any of the chicks in the experiment. The experiment showed that a ration consisting of yellow corn, middlings and skim-milk, when fed ad libitum, did not supply sufficient phosphorus for the best growth of young chicks and that the calcium and phosphorous in tricalcium phosphate were readily available for the metabolic processes of growing chicks. There were no significant differences in the mortalities of the various lots during the first twelve weeks, the highest mortality in any lot being eight per cent.

Parasites in Poultry. Some interesting observations have been made in the study of poultry diseases. The frequency of parasitism in chickens has been found to be unusually high. In many flocks, the extent of infestation has been so great as to leave no doubt as to the importance of the parasites as a factor in the health of the flock. The treatment and prevention of infectious diseases in poultry is a hopeless task when the birds are in a debilitated condition from the effects of parasites. In a number of instances, birds suffering supposedly from some infectious disease or some nutritional disturbances were found, upon examination, to be free from any demonstrable evidence of bacterial infection, neither could the trouble be attributed to improper care and management. However, they were found to be heavily infested with parasites and in those cases where it was possible, the removal of the parasites usually resulted in recovery.

Several enzootics of taeniasis in poultry, caused by a tapeworm not considered common in the United States until quite

recently, have been studied. The mature form of this tapeworm (*Davainea proglottina*) does not exceed one-eighth inch in length. The parasite is found in the anterior third of the intestine. The head is deeply buried in the mucosa and the parasite is not visible on gross examination. If pieces of the intestine in which the parasite is located are cut open and floated in a dish of clear water, the distal segments of the tapeworm will float out from the mucosa of the gut and become visible. Sections of intestines examined microscopially reveal the real damage done by this parasite. The pathological disturbances consist of congestion, hemorrhage and degeneration. Most of the birds that showed a large number of tapeworms were from flocks in which so-called paralysis or range paralysis was reported as the principal trouble.

Fermentative Characters of Bacterium Pullorum. An investigation of the fermentative characters of *Bacterium pullorum* indicated that while it may produce acid when cultivated for long periods of time in maltose broth, yet the organism does not attack dextro-maltose; nor does *Becterium pullorum* produce an immediate acidity in maltose serum water when unheated maltose is used in the tests. The results obtained indicate that lactic acid production in maltose broth by *Bacterium pullorum* is due to the fermentation of products resulting from the alkaline hydrolysis of the sugar and not from the direct action of the bacterium on the maltose.

Infection in Foals. Until January 1, 1926, only four cases of *Bacterium viscosum equi* in foals had been recorded in the United States and these were from this laboratory. During 1926, eleven cases of infection by this microorganism were encountered, these cases being diagnosed as a result of post mortem examinations held on twenty-two foals. From January 1 to December 1, 1927, post mortem examinations were held on 41 foals. Of these 21, or 51.2 per cent, were found to harbor *Bacterium viscosum equi.* Thirty-two foals were examined between January 1 and June 30, 1927. Of these, 14, or 46.7 per cent, were found to harbor *Bacterium viscosum equi.* Between July 1 and December 1, 1927, 9 foals were examined and

six of them, or 66.6 per cent, were found to harbor the infection.

In some of the older foals, chronic pathological lesions furnished substantial evidence that the infection was of prenatal origin. However, in others from which *Bacterium viscosum equi* was isolated, the pathological changes neither in character nor location indicated that the infection could have been present before birth. The older foals (4 to 6 months) were all badly infested with parasites and had well-developed verminous aneurysms in the anterior and posterior mesenteric arteries and their branches. *Bacterium viscosum equi* was invariably found in the diseased portion of the aneurysms.

European investigators have expressed the opinion that this microorganism is carried into the system from the intestines by the parasite (*Strongylus vulgaris*) which is the cause of the aneurysm. The observations made at this station show that in many cases *Bacterium viscosum equi* infection is prenatal in origin. In other cases, infection apparently took place after birth. If this bacterium is carried into the system by the animal parasite, *Strongylus vulgaris,* then the prevention of strongylosis in colts will also help to prevent cases of *Bacterium viscosum equi* infection in older foals.

Infectious Abortion of Cows and Mares. Four hundred and forty-eight samples of blood from 52 herds of cows were tested for infectious abortion. The bacterin treatment for this disease was administered to 1,246 head of cattle on 52 farms. Thirty-eight samples of blood were tested for infectious abortion in mares. Twenty aborted fetuses were examined. *B. abortivo-equinus* was isolated from three of these, a streptococcus from five, while the others gave negative results. The mares in which *B. abortivo-equinus* was isolated from the aborted fetuses had not previously been vaccinated against this germ. Bacterin made from the *B. abortivo-equinus* was administered to 1,799 mares on 53 farms. Investigations show that vaccination protects mares from infectious abortion due to *B. abortivo-equinus.* Nineteen samples of blood from swine were tested for infectious abortion and 397 head of swine

on eleven farms were vaccinated against abortion with bacterin.

Three herds of cows, some individuals of which were found to be affected with infectious abortion, have been placed under the direction of the Experiment Station for experimental purposes. Blood tests for infectious abortion were made of all the cows in these herds. After this test, half of the cows were vaccinated with a bacterin made from *B. abortus* Bang and the other half were not treated. In dividing a herd, attention was given to the results of the blood tests so that a like number of treated reactors and non-reactors were left untreated.

In the routine of the agglutination test for infectious abortion in cows, it was found that the blood of certain cows did not react positively to the stock antigen made up of two strains of *Bacterium abortus* (Bang) altho the history of these cows pointed to a positive reaction. It was thought that perhaps the blood of these cows would react to an antigen made up of a strain of the organism not found in the stock antigen. To determine the variable agglutinating properties of different strains of *Bacterium abortus* (Bang) a number of antigens were used. At times as many as twenty, made from different strains of this organism, were employed. The results showed that a few cows will respond negatively to an antigen made up of a particular strain and positively to another strain of the organism. The results of this investigation with 28 herds of cows, involving 182 head, showed that the blood from 47 cows reacting positively to one of the several or many antigens reacted negatively to the stock antigen ordinarily used. This variation in the agglutinability of different antigens, in all probability, accounts for the occasional variation in tests of the same blood of a cow or cows sent to different laboratories. Since obtaining these results, more than one antigen is used in the routine testing of cows for infectious abortion.

Mycobacterium Paratuberculosis. This organism, which is the cause of Johne's disease in cows and scrapie in sheep, has been isolated and cultivated. It is the second time that the

organism has been isolated in this country and the sixth time that it has ever been isolated.

Urinalysis of Sheep. The normal urinalysis of sheep has been determined. The urine of normal sheep is clear, with a yellowish color, alkaline in reaction, and with a specific gravity of 1.031. It contains 2.5 per cent urea, 0.01 per cent ammonia, and has a total nitrogen content of 1.4 per cent. It contains no sugar, albumen or acetone, whereas the urine of ewes having the so-called pregnancy disease, is acid in reaction, contains albumen, acetone and considerable ammonia. It was found that in this disease the buffers of the blood are markedly diminished. The name of "acidosis of pregnant ewes" has been given to the disease. The calcium content of the blood of ewes with acidosis was considerably lower than the calcium content of the blood of normal ewes.

Steer Feeding. A feeding test was conducted to compare the daily rate of gain and economy of grains between (lot 1) steers fed corn during the winter and finished on grass without grain; and (lot 2) steers carried thru the winter on roughage and finished on grass with corn.

The initial average weight of the steers in lot 1, was 902 pounds and their final average weight, 1,203 pounds, an average gain per steer of 301 pounds.

The corresponding weights for the steers in lot 2, were 891 and 1,209 pounds, respectively, an average gain per steer of 318 pounds.

The returns over the feed consumed were $29.50 per head for the steers in lot 1, and $32.60 per head for those in lot 2. The initial cost of the cattle was $7.65 per hundredweight. The steers in lot 1 were sold on the Cincinnati market June 18, 1927, for $11.50 per hundredweight; those in lot 2 were sold on the same market, the same day, for $12.25 per hundredweight. The pork credit for the steers in lot 1 was $22.88, and for the steers in lot 2, $6.05. There was practically no difference in the dressing percentage of the steers in these two lots or in the quality of carcass produced.

Codling Moth Control. For several years, the damage from codling moth has been on the increase, in spite of careful spraying such as had formerly given control. In an attempt to gain better control of this destructive pest, a series of tests were undertaken in the Barrett orchards at Henderson, Kentucky. A brief summary of the results, based upon variations in kind and amount of material used and in periods of application, follows: Satisfactory control was obtained by the use of arsenate of lead under the following conditions during the 1927 season—(a) When at least 3 pounds of arsenate of lead were used per 100 gallons of spray (5 pounds gave only slightly better control). (b) When the application was practically doubled in gallons per tree, that is, 8 to 10 gallons instead of 4 to 5 gallons per tree, as commonly applied; (c) When spray began with calyx application and extended to July 26 (omission of the last spray increased the injury, and omission of the calyx application gave very poor control); (d) when the general sanitary measures were carefully carried out as a supplement to spraying. The use of summer oils proved unsatisfactory both from the standpoint of worm control and their effect on the finish of the fruit. The addition of calcium caseinate as a sticker showed no beneficial results. Sprays applied at more frequent intervals than commonly recommended, did not give material advantage in worm control.

In connection with these tests, it is interesting to note that analyses of the fruit from each plot, taken from the top, middle and lower part of the tree, showed the range of arsenical residue to be well under the tolerance limit, even on plots receiving double the usual proportion of arsenic and with heavy applications per tree.

Apples as Fillers in Apple Orchard. Results from the Experiment Station orchard indicate that apples as fillers in an apple orchard should be limited to varieties notably productive at an early age; and that the permanent trees should be more than 33 feet, and probably at least forty feet, apart in fertile soils of the Bluegrass region, if apple fillers are to be used, so

that the filler trees may have a longer period for production after arriving at bearing age.

Feed Control. The introduction in Kentucky of quality standards for special purpose mixed feeds has attracted much interest from both the feeder and manufacturer. There has been fine cooperation and substantial progress has been made in bringing about better feed standards and an adherence to the purpose of the law.

A very general interest in the subject of supplementary mineral feeds has been aroused for the past two or three years, largely on the basis of suggestion rather than evidence, and quite a flourishing business in these products has been the result. The sale of these products does not stop with the serving of actual requirements when deficiencies exist but, thru propaganda and high pressure salesmanship, the manufacturers of these mixtures have exacted an enormous sum from the uninformed feeders of Kentucky. The use of expensive proprietary mineral mixtures is not necessary in this state and generally proves uneconomical.

Complete analyses, chemical and microscopical, have been made of 1,112 samples and the results reported to those concerned. These analyses covered a variety of materials and were for a number of purposes. Seven suits have been filed during the year for violations.

Creamery and Tester's License. Licenses, authorizing their holders to buy milk or cream on the basis of the butterfat contained therein, have been issued to 37 creameries, milk plants and ice cream manufacturers in operation for one year or more; 7 such plants beginning operation this year; 5 cooperative buying and shipping agencies; 45 independent buyers; 733 cream buying stations in operation June 30 and 156 cream buying stations beginning operation since June 30, a total of 983.

Seven hundred and seventy-eight notices of examination for tester's license were sent out and 474 applicants appeared. Of the number examined, 356 or 75 per cent made a passing grade. Thirty examinations were held as follows: Louisville

6, Lexington 5, Bowling Green 5, Paducah 5, Owensboro 4, Cincinnati 3, Maysville 1 and Fulton 1.

There are now 1,133 authorized testers in Kentucky. Of this number, 712 hold renewal license, granted July 1, 1927, 250 are new operators licensed since that date and 171 are operating on permits.

A total of 609 inspections were made during the year. Based on these inspections, the operators were graded as follows: A, B and C grades, 508; D grade (probation) 92; E (revocation of license recommended) 9. Acting upon these inspections, the Examining Board revoked the licenses of three operators; two were carried over and four operators now have their licenses temporarily revoked pending action of the Board. One concern was convicted of violating the creamery license law and fined $100 and costs.

The glassware inspection covered 31,481 pieces, with the rejection of 80 as inaccurate.

The receipts for the year were $10,061.27 and the expenditures $8,535.88 distributed as follows:

Salaries	$5,814.84
Labor	477.29
Postage and stationery	223.55
Freight and express	32.02
Sundry and laboratory supplies	161.75
Travel	1,642.33
Furniture and fixtures	84.60
Contingent	99.50
Total	$8,535.88

Public Service Laboratories. The laboratories perform many public services covering a wide range of activity and usefulness. Investigations vary from analysis in suspected poison cases to examination for the identification of bacterial infections. Every county in the state, with the exception of Edmonson and Cumberland Counties, has availed itself of the services of these laboratories. Specimens have been received from 1,165 physicians. The specimens examined totaled 58,444

for the year, distributed as follows: drug samples, 179; food samples, 951; bacteriological specimens, 57,314. In addition, 34,423 specimen containers were sent out, an increase of more than 3,600 over last year.

Seed and Nursery Inspection. About the average number of tests of seeds (4,000) have been made during the year, and the results reported to those concerned. In all, one hundred and twenty nurseries have been inspected and seventy-four given certificates, some of them after their owners had agreed to fumigate or otherwise treat some portions of their stock because of the presence of pests. At present, there are on file duplicates of permits issued to 138 non-resident nurseries doing business in Kentucky.

Robinson Substation. All field crops and small fruits were damaged by the floods. The orchard and vineyard were injured by the frosts, but in spite of the frosts there was a good showing of grapes on the older one hundred vines.

Mapping and estimating timber has been continued and a little over two thousand acres covered. In addition the base line for several hundred more acres was run. Three permanent sample plots were laid out in yellow poplar, and two of them cleaned. The fall fire season was unusually severe and la ted about six weeks. Nine miles of new trail were constructed and maintenance work done on twenty-one miles. The floods of the spring did a great deal of damage to trails.

One of the cottages on the Substation grounds has been furnished and equipped as a demonstration home, and classes in cooking and sewing have been conducted for women and high school girls. Another cottage has been equipped with a small hand-power canning outfit, and tho there was a scarcity of garden products because of the floods, yet approximately three hundred cans of beans, corn and tomatoes were canned.

The Second Robinson Harvest Festival was held Septem ber 28 and 29, with an attendance of about one thousand persons. The products exhibited were superior to those of last year.

Western Kentucky Substation. The work for the year has consisted largely in the continuation of all experimental projects begun in 1926, the initiation of new projects, the completion of numerous property improvements and the holding of several field day meetings.

The results of the soil and crop experiments, even tho just recently started, have attracted the attention and interest of all who have visited the fields this year—by actual count over 500 persons. Of those portions of the farm not utilized for definite experimental projects, the areas which were seeded to pasture mixtures following limestone and superphosphate in 1926, are worthy of special mention. A mixture of sweet clover, lespedeza and orchard grass has produced most excellent pasture on thin land of the farm. On another tract, probably the thinnest land on the entire Substation farm, and decidedly the poorest for drainage, a mixture of sweet clover, alsike, lespedeza, orchard grass and redtop has given highly satisfactory results.

New Projects. The following projects have been initiated:

Studies of the anti-rachitic potency of the sun's rays at the latitude of Kentucky.

A study of agricultural credit and finance in Kentucky.

Plant disease investigations: Eradication of fire blight in a pear and apple orchard.

Control of soil erosion. Western Kentucky Substation.

Improvement of mongrel poultry flocks by the use of pure-bred males. Robinson Substation.

Selective poultry flock improvement by culling and use of pedigreed breeding males. Western Kentucky Substation.

Strawberry culture experiments. Western Kentucky Substation.

Apple experiments. Western Kentucky Substation.

Western Kentucky codling moth investigations.

Bush fruit experiments. Western Kentucky Substation.

Personnel. A list of the Experiment Station staff is given on page 2 of this report. The appointments and resignations for the year 1927 follow:

Appointments:

R. E. Proctor, assistant in farm management, department of farm economics, February 1.

Jessie Terry, seed analyst. March 17.

Lewis W. Taylor, assistant in poultry husbandry. September 1, 1927.

E. S. Hill, assistant chemist, department of chemistry. July 5.

Lucille Dobbins, seed analyst. August 1.

K. R. Zent, assistant in marketing, department of markets and rural finance. October 1.

Oliver H. Pinney, assistant bacteriologist, department of public service laboratories. October 10.

L. V. Amburgey, microscopist, department of feed control. October 5.

Transfer in Position:

J. S. McHargue, chemist, to acting head of the department of chemistry. July 1.

G. D. Buckner, chemist, to in charge section of animal nutrition, department of animal husbandry. July 1.

Resignations:

Carrie Lee Hathaway, seed analyst. March 1.

J. J. Hooper, in charge of dairying. June 30.

Marie Jackson, seed analyst. July 31.

W. A. Anderson, Jr., microscopist. September 17.

E. J. Gott, bacteriologist. November 1.

J. F. Bullard, assistant veterinarian. November 14.

Library. The total accession of books in the Experiment Station library for the year 1927 amounts to 12,335, an addition of 676 volumes during the year. The number of periodicals subscribed for is 117 domestic, and 33 foreign.

Publications.

Bulletins:

No.

277. Soils of the Purchase Region of Kentucky. S. D. Averitt and S. C. Jones. February, 1927.

278. Marketing Kentucky Livestock. E. C. Johnson. April, 1927.
279. Commercial feeding stuffs in Kentucky in 1926. J. D. Turner, H. D. Spears, W. G. Terrell and W. A. Anderson, Jr. April, 1927.
280. Observations and experiments on the control of true tobacco mosaic. W. D. Valleau and E. M. Johnson. September, 1927.
281. Tobacco frenching—a nitrogen deficiency disease. W D. Valleau and E. M. Johnson. December, 1927.
282. Analyses of commercial fertilizers. H. E. Curtis, H. R. Allen and Lelah Gault. December, 1927.

Report:

Thirty-ninth annual report of the Experiment Station—1926. Thomas Cooper.

Scientific papers (in print):

Kentucky versus other states. Thomas Cooper. Kentucky School Journal. April, 1927.

Waste resulting from the lack of effective contact with investigations planned for a permanent program for Southern Agriculture. Thomas Cooper. Proceedings 28th Annual Convention Association Southern Agricultural Workers.

What is the problem of mountain agriculture? Thomas Cooper. Mountain Life and Work. July, 1927.

Report on The Agricultural Situation. Special Committee Association of Land Grant Colleges and Universities. Thomas Cooper, Chairman.

The effect of a strain of tobacco mosaic on the yield of Burley tobacco. W. D. Valleau and E. M. Johnson. Phytopathology, Vol. XVII, No. 8, pp. 523-527. 1927.

Commercial tobaccos and cured leaf as a source of mosaic disease in tobacco. W. D. Valleau and E. M. Johnson. Phytopathology, Vol. XVII, No. 8, pp. 513 522. 1927.

Some observations on the use of animal manure and crop residues. George Roberts. Journal American Society of Agronomy. November, 1927.

Production of nodules on different parts of the root systems of alfalfa plants growing in soils of different reactions. P. E. Karraker. Soil Science, Vol. 24. No. 2, pp. 103-107. August, 1927.

The delayed effect of liming. P. E. Karraker. Ibid. pp. 147-148.

Nitrates and wheat yields after certain crops. P. E. Karraker. Soil Science, Vol. 24, No. 4, pp. 247-258. 1927.

The variable occurrence of nitrate in soils. P. E. Karraker. Ibid. pp. 259-262.

The soil reaction of fields growing alfalfa and the use of field tests in its determination. P. E. Karraker, Ralph Kenney and B. F. Kenney. Journal American Society Agron., Vol. 19, No. 4, pp. 351-356. April, 1927.

Genital infection of mares by an organism of the encapsulatus group. W. W. Dimock and P. R. Edwards. Journal American Vet. Med. Asso., Vol. 70, N. S. No. 23, pp. 469-480. January, 1927.

Studies on abortion in mares. 1. The diagnosis and differential diagnosis of contagious abortion. W. W. Dimock and E. S. Good. 2. The results of vaccination against contagious abortion in mares. E. S. Good and W. W. Dimock. Journal American Veterinary Medical Association, Vol. 71, N. S. 24, No. 1, pp. 25-34. April, 1927.

A comparison of the agglutination test and the intradermal test in the detection of bacillary white diarrhea. P. R. Edwards and Floyd E. Hull. Ibid. pp. 590-599. August, 1927.

The loss of nitrogen from chicken droppings during drying. G. Davis Buckner and A. M. Peter. Poultry Science, Vol. 6, No. 2. December-January, 1926-1927.

The inheritance of coat color in domestic livestock. W. S. Anderson. The Cattleman. February, 1927.

The aid being rendered mountain religious and social workers by the extension divisions of our agricultural

colleges. W. S. Anderson. Mountain Life and Work. July, 1927.

The calcium metabolism of the laying hen. G. Davis Buckner. The transactions of the Third World's Poultry Congress, Ottawa, Canada. August, 1927.

The proportion and significance of copper, iron, manganese and zinc in some mollusks and crustaceans. J. S McHargue. Transactions Kentucky Academy of Science, Vol. 2. 1927.

The significance of small amounts of inorganic elements in plants. J. S. McHargue. Presented at First International Congress of Soil Science, Washington, D. C. June, 1927. Soil Science. January, 1928.

Significance of the occurrence of manganese, copper, zinc, nickel and cobalt in Kentucky bluegrass. J. S. McHargue. Industrial and Eng. Chemistry, Vol. 19, No. 2, p. 274. February, 1927.

American contemporaries. Alfred Meredith Peter. J. S. McHargue. Indus. and Eng. Chemistry, Vol. 19, p. 1067. September, 1927.

Rapid boiling as an aid to a shortened period of digestion in the determination of nitrogen. O. M. Shedd. Journ. Assoc. Official Agr. Chemists, Vol. X, No. 5, pp. 508-520, 1927.

Public health in Kentucky. D. J. Healy. Ky. State Med. J., Dec., 1927.

The following have not yet been published, but have been accepted or are in an advanced state of preparation:

The relative utilization of different calcium compounds by hens in the production of eggs. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Journal Agricultural Research.

Some results from the use of potassium thiocyanate and ethylene chlorhydrin in hastening sprouting of immature Irish Cobbler potato tubers. A. J. Olney.

Acidosis of pregnant ewes: So-called pregnancy disease of sheep. W. W. Dimock, D. J. Healy and J. F. Bul-

lard. Journ. American and Vet. Med. Asso. (In press).

Modern Science and the smaller college. D. J. Healy. Centre College Magazine. (In press).

Diminished plasma buffer value in pregnancy disease of ewes. D. J. Healy and F. E. Hull. Cornell Veterinarian. (In press).

The colorimetric measurement of the reaction of air-dried soils. D. J. Healy. First International Congress of Soil Science, Washington, D. C. June, 1927.

Isolation and cultivation of *Mycobacterium paratuberculosis.* D. J. Healy and W. W. Dimock. Kentucky Academy of Science. May, 1927.

A normal sheep urinalysis. D. J. Healy, J. F. Bullard and H. D. Spears. American Vet. Med. Asso., Philadelphia. September, 1927.

Soil reaction and its colorimetric measurement. D. J. Healy. Lexington Section, Amer. Chem. Soc. November, 1927.

Dr. Robert Peter—Biographical sketch. J. S. McHargue. Accepted for publication by the Journal of Chemical Education of the American Chemical Society.

FINANCIAL STATEMENT

In Account with the United States Appropriations, 1926-1927:

	Hatch Fund	Adams Fund	Purnell Fund
Receipts from the Treasurer of the United States, as per appropriations for fiscal year ended June 30, 1927, under acts of Congress approved March 2, 1887 (Hatch Fund), March 16, 1906 (Adams Fund), and February 24, 1925 (Purnell Fund)	$15,000.00	$15,000.00	$30,000.00
By salaries	$14,821.32	$14,764.45	$25,342.20
Labor		235.55	1,186.72
Stationery and office supplies			25.19
Scientific supplies, consumable			674.40
Feeding stuffs			6.75
Sundry supplies			115.65
Communication service			30.00
Travel expenses	148.24		1,674.11
Transportation of things			44.27
Publications	30.44		355.29
Furniture, furnishings, fixtures			249.80
Library			123.24
Scientific equipment			172.38
Balance			
Total	$15,000.00	$15,000.00	$30,000.00

We, the undersigned, duly appointed Auditors of the Corporation, do hereby certify that we have examined the books and accounts of the Kentucky Agricultural Experiment Station for the fiscal year ended June 30, 1927; that we have found the same well kept and classified as above; that the balance brought forward from the preceding year was $ none on the Hatch Fund, $ none on the Adams Fund, and $ none on the Purnell Fund; that the receipts for the year from the Treasurer of the United States were $15,000.00 under the act of Congress

of March 2, 1887, $15,000.00 under the act of Congress March 16, 1906, and $30,000.00 under the act of Congress of February 24, 1925, and the corresponding disbursements $15,000.00 $15,000.00; and $30,000.00; for all of which proper vouchers are on file and have been by us examined and found correct, leaving balances of $ none, $ none and $ none, respectively.

And we further certify that the expenditures have been solely for the purpose set forth in the acts of Congress approved March 2, 1887, March 16, 1906, and February 24, 1925, and in accordance with the terms of said acts respectively.

Signed:

F. M. McKee,
Richard C. Stoll,
Auditors

Attest:
Margaret Williams,
Custodian of the Seal.

METEOROLOGICAL SUMMARIES

For the Year 1927

Compiled from the Records of the U. S. Weather Bureau Station, Lexington, Ky.

ANNUAL METEOROLOGICAL SUMMARY

Month	Temperature, Degrees Fahrenheit							Relative Humidity Per cent 7 a. m.	Precipitation, in Inches				Per cent of Sunshine	Wind					Number of Days											
	Mean			Extreme												Maximum For 5 mins.										Max. Temp.		Min. Temp.	
	Maximum	Minimum	Monthly	Maximum	Date	Minimum	Date		Total	Maximum in 24 hours	Date	Total Snowfall, Ins.		Average Hourly Velocity	Prevailing Direction	Velocity	Direction	Date	Gales, 40 miles per hour or over	Clear	Partly Cloudy	Cloudy	Precipitation of .01 inch or more	With trace or more of snow	Thunderstorms	Dense fog	90 deg. or above	Freezing or below	Freezing or below	Zero or below
January	41.1	25.8	33.4	60	30	—1	15	87	6.53	1.63	20-21	1.1	28	13.9	SW	38	SW	19	0	4	9	18	14	5	1	3	0	5	19	1
February	51.4	35.5	43.4	72	17	21	21	88	1.87	*0.53	19-20	7.6	36	14.8	SW	52	NW	25	3	6	8	14	13	7	2	1	0	3	9	0
March	56.0	39.4	47.7	75	16	20	2	85	5.17	1.49	31	3.5	35	13.6	SW	40	NW	7	1	7	8	16	11	2	4	2	0	0	7	0
April	64.6	46.2	55.4	83	19	32	24	84	3.89	0.79	29-30	0	40	14.5	SW	60	NW	29	3	7	10	13	14	0	6	1	0	0	0	0
May	72.0	54.8	63.4	90	21	40	1	82	5.76	1.03	8	0	43	14.4	SW	48	SE	29	5	7	15	9	20	0	15	0	0	0	0	0
June	77.2	60.3	68.8	92	30	50	6	82	2.14	0.60	17-18	0	51	11.2	SE	40	SW	21	2	13	8	9	10	0	6	0	2	0	0	0
July	84.4	66.0	75.2	95	28	55	5	76	2.95	1.26	30-31	0	59	11.2	SW	37	SW	14	0	13	15	3	12	0	7	0	5	0	0	0
August	77.6	61.4	69.5	88	13	52	26	82	2.09	1.24	13-14	0	57	9.5	E	30	W	8	0	17	6	8	9	0	4	1	0	0	0	0
September	81.4	63.0	72.2	93	14	41	21	74	2.29	1.44	30	0	67	9.8	SW	47	SW	29	4	14	10	6	7	0	7	1	6	0	0	0
October	70.6	51.6	61.1	86	1	35	19	73	1.65	1.01	12	0	70	12.3	SW	36	S	11	0	20	4	7	6	0	3	0	0	0	0	0
November	57.9	41.3	49.6	74	11	23	19	82	4.88	2.43	16-17	0.3	36	16.0	SW	52	NW	30	2	9	6	15	11	3	1	1	0	1	9	0
December	43.2	26.8	35.0	70	13	2	31	86	3.64	1.30	12	0.4	41	14.5	SW	50	SW	13	4	11	3	17	13	5	1	1	0	6	22	0
Year	64.8	47.7	56.2	95	July 28	—1	Jan. 15	82	42.86	2.43	Nov. 16-17	12.9	47	13.0	SW	60	NW	Apr. 29	24	128	102	135	140	22	57	17	13	15	66	1

*From interpolated snowfall.

MONTHLY AND ANNUAL MEAN TEMPERATURE

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1872											37	27	
1873	30	35	42	53	66	74	75	74	67	53	40	39	54.0
1874	36	38	44	46	66	77	78	75	71	57	45	38	56.0
1875	27	29	42	49	64	72	76	71	64	52	43	43	52.7
1876	41	39	41	52	65	72	77						
1887											44	35	
1888	31	36	41	56	63	72	76	74	63	51	46	37	54.0
1889	37	32	46	55	63	69	75	72	65	52	43	50	55.0
1890	44	45	39	56	63	77	76	71	67	56	49	37	56.6
1891	37	41	40	57	62	76	73	73	72	55	43	43	56.0
1892	28	41	39	54	63	76	75	75	68	57	41	33	54.1
1893	23	36	43	57	61	72	79	74	70	57	43	37	54.4
1894	38	34	49	54	62	75	76	76	71	58	41	37	55.9
1895	28	23	43	56	62	75	73	76	73	52	45	37	53.7
1896	34	35	38	62	71	72	75	75	67	54	48	38	55.9
1897	30	37	48	53	59	72	76	74	72	64	46	37	55.7
1898	38	36	49	50	65	74	76	76	72	56	43	33	55.8
1899	34	24	42	56	67	75	77	77	68	61	48	33	55.1
1900	36	31	39	55	66	72	77	79	73	65	45	37	56.3
1901	34	29	44	49	63	74	80	74	67	58	40	31	53.6
1902	32	25	45	53	68	71	77	74	67	59	53	34	54.8
1903	32	36	50	53	68	68	77	74	70	57	40	28	54.4
1904	30	31	46	48	64	72	74	74	69	57	44	34	53.5
1905	24	25	49	54	66	72	75	74	68	55	44	35	53.5
1906	37	32	36	57	64	72	74	76	71	55	45	36	54.5
1907	40	32	52	45	59	69	76	73	68	53	42	37	53.8
1908	33	33	50	55	65	72	76	75	72	58	48	38	56.1
1909	37	41	43	54	62	73	73	74	66	53	53	28	54.6
1910	32	31	54	54	59	69	75	73	70	60	40	29	53.7
1911	38	40	43	52	70	74	76	76	72	58	40	41	56.6
1912	23	28	39	57	65	69	75	72	70	59	44	36	53.1
1913	42	33	44	53	65	73	78	77	69	56	49	38	56.5
1914	37	29	40	54	66	76	78	75	67	59	46	30	54.6
1915	32	40	36	59	62	70	74	70	70	60	49	36	54.8
1916	40	33	41	52	67	69	78	76	67	58	47	34	55.2
1917	35	32	44	54	57	70	74	74	67	50	44	25	52.3
1918	20	38	49	52	69	72	73	79	62	61	44	43	55.2
1919	37	36	46	54	62	76	79	74	72	64	45	31	56.3
1920	30	33	45	50	62	71	74	72	70	62	43	36	54.1
1921	37	38	55	58	65	76	80	75	73	57	48	39	58.4
1922	33	38	47	57	68	75	76	75	73	61	47	39	57.3
1923	39	32	43	53	63	74	77	74	69	56	45	45	55.8
1924	30	33	39	55	58	73	73	75	64	62	45	34	53.5
1925	33	43	47	59	60	76	75	76	76	50	43	32	55.8
1926	32	37	37	49	65	69	77	76	72	57	41	35	53.8
1927	33	43	48	55	63	69	75	69	72	61	50	35	56.2

TEMPERATURE EXTREMES

Month	Highest	Year	Day	Lowest	Year	Day
January	72	1906	21	—14	1918	12
February	75	1918	28	—20	1899	13
March	85	1910	24	— 1	1873	4
April	90	1925	24	15	1875	18
May	93	1911	28	30	1876	1
June	99	1914	27	40	1910	3
July	102	1901	22	51	1891	9
August	100	1918	6	46	1915	31
September	99	1925	9	32	1899	30
October	89	1919	2	21	1925	29
November	78	1895	7	2	1872	29
December	71	1875	31	— 9	1917	10

MONTHLY AND ANNUAL PRECIPITATION

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1872											1.21	3.30	
1873	2.53	4.05	3.73	2.89	6.05	4.49	3.37	2.94	1.60	5.47	1.92	4.48	43.52
1874	5.41	4.89	5.90	6.81	0.79	3.55	6.26	1.57	2.89	0.92	4.27	3.83	47.09
1875	2.61	3.12	6.18	2.06	2.43	4.16	11.24	0.62	1.72	2.37	5.87	3.68	46.06
1876	6.06	1.66	3.63	4.20	2.16	4.13	3.84						
1887											3.02	2.71	
1888	4.39	2.93	5.82	3.17	3.29	2.97	4.21	8.76	1.22	3.02	5.15	1.88	46.81
1889	5.66	1.78	1.63	1.52	3.53	3.49	5.82	1.15	6.79	3.06	5.34	1.73	41.50
1890	5.34	8.13	9.91	3.59	4.71	7.43	3.14	7.32	1.82	2.38	3.54	4.05	61.36
1891	4.70	4.36	7.63	1.85	1.17	5.33	3.23	6.48	1.26	1.33	5.38	2.82	45.51
1892	2.35	3.10	4.01	6.57	5.32	3.81	6.22	3.28	4.10	0.45	3.72	3.03	45.96
1893	2.10	4.44	3.30	5.81	3.88	4.24	3.11	1.86	2.25	5.59	3.36	2.61	42.55
1894	3.58	3.33	2.13	4.19	3.81	4.44	0.87	3.67	4.05	1.40	1.38	3.45	36.32
1895	5.60	0.52	2.79	3.17	4.05	2.93	5.07	1.56	0.33	1.28	2.52	5.50	35.32
1896	1.25	3.15	5.41	0.40	3.20	3.74	10.39	3.37	4.25	1.27	4.30	2.56	43.29
1897	2.59	6.33	6.55	5.80	4.48	4.77	4.34	3.21	0.80	0.38	4.83	5.11	49.19
1898	9.56	2.20	8.18	3.29	6.13	7.94	5.72	2.99	3.55	5.27	2.89	2.80	60.52
1899	6.69	2.84	8.61	2.16	3.63	2.55	0.97	4.18	1.90	2.09	1.70	2.92	40.24
1900	2.13	3.17	1.98	1.23	3.54	2.19	2.80	5.75	1.85	0.79	6.38	1.86	33.67
1901	1.49	0.62	2.23	4.52	2.67	3.70	2.61	3.74	2.18	1.33	1.73	3.50	30.32
1902	4.77	0.90	2.92	1.27	2.43	5.19	2.33	1.89	2.60	2.11	3.09	6.60	36.10
1903	1.68	6.16	3.24	3.29	1.75	2.71	2.62	1.49	0.81	2.12	2.84	1.99	30.70
1904	1.02	2.38	4.75	3.08	2.60	2.51	3.13	2.44	1.71	0.57	0.53	3.10	28.72
1905	2.04	2.13	5.87	2.87	5.54	3.31	4.94	4.11	3.20	3.45	3.58	4.13	45.17
1906	2.29	1.84	6.45	1.11	3.15	4.68	3.89	4.92	5.03	0.74	3.95	4.54	42.59
1907	9.06	1.89	4.13	1.83	3.89	3.65	4.42	2.07	2.72	2.76	2.67	2.28	41.37
1908	1.85	4.81	8.17	4.99	4.20	2.12	3.60	2.98	0.38	0.72	1.65	2.13	37.60
1909	3.35	6.86	3.97	6.72	4.15	5.41	5.98	1.26	4.88	2.05	1.96	2.77	49.36
1910	4.46	4.11	0.46	4.22	6.24	5.92	7.66	4.15	7.93	1.67	1.72	2.81	51.34
1911	2.44	2.21	2.31	4.46	1.07	3.01	0.92	2.84	4.37	3.67	3.84	6.20	37.34
1912	1.78	2.50	4.36	6.89	5.11	2.15	4.70	3.23	2.09	0.51	1.02	3.66	38.00
1913	10.35	2.61	6.04	2.41	4.32	3.29	2.43	1.00	1.76	3.40	4.00	2.74	44.35
1914	2.50	3.87	2.24	2.23	1.65	4.77	2.63	4.69	1.82	5.32	1.62	4.40	37.74
1915	4.38	1.12	1.49	0.65	7.23	3.20	5.72	6.03	3.74	0.81	3.90	6.67	44.94
1916	5.65	3.40	3.30	1.01	2.92	5.33	1.72	2.34	2.75	2.04	1.25	3.63	35.34
1917	5.67	2.12	5.48	3.97	3.51	3.54	2.80	1.94	2.46	2.36	1.03	1.97	36.85
1918	4.46	1.92	1.55	2.09	4.13	3.61	2.01	2.68	1.41	4.57	2.24	4.83	35.50
1919	2.48	1.61	3.71	3.51	6.38	4.49	2.28	2.39	1.12	7.95	8.50	6.70	51.12
1920	5.26	2.11	4.62	6.42	2.51	2.39	1.73	6.71	4.88	2.75	2.22	1.40	43.00
1921	3.24	2.62	5.06	3.28	1.00	2.16	1.04	3.88	5.10	2.46	6.89	5.74	43.07
1922	1.87	3.12	7.75	4.46	3.10	2.44	2.13	2.20	5.99	1.25	0.88	5.67	40.86
1923	6.63	4.40	4.65	5.43	1.66	3.55	5.01	4.02	1.51	0.56	2.71	6.50	46.63
1924	5.00	2.60	2.42	3.75	3.04	4.04	2.77	2.28	3.89	0.11	1.32	5.95	36.81
1925	3.41	3.03	3.45	2.49	3.56	3.96	3.63	1.15	1.70	5.83	4.52	0.80	37.52
1926	4.43	2.27	2.52	1.54	2.06	2.78	5.95	7.03	4.04	7.46	3.21	4.32	47.61
1927	6.53	1.87	5.17	3.89	5.76	2.14	2.95	2.09	2.29	1.65	4.88	3.64	42.86

EXTREMES OF PRECIPITATION AND WIND

Month	PRECIPITATION			WIND			
	Greatest in 24 hrs.	Year	Day	Max. Vel.	Dir.	Year	Day
January	3.50	1913	11	60	sw	1891*	1
February	3.04	1909	23-24	60	sw	1890*	25
March	3.61	1913	25-26	68	sw	1919	17
April	3.25	1909	29-30	64	sw	1909	29
May	2.61	1898	6-7	60	nw	1889*	12
June	4.45	1898	26-27	60	n	1890*	29
July	4.02	1875	11-12	58	nw	1915	30
August	2.98	1915	1-2	72	s	1918	6
September	5.45	1922	3	68	w	1889	8
October	2.78	1925	16-17	50	nw	1904*	21
November	3.95	1919	25-26	62	s	1895*	26
December	3.63	1919	6	60	sw	1895*	26

*Also in subsequent years.